Before the
Federal Communications Commission
Washington, DC 20554

In the matter of	)	
	)	
Revision of Part 15 of the Commission's Rules	)	ET Docket 98-153
Regarding Ultra-Wideband Transmission	)	
Systems	)	

To: The Commission

PETITION FOR PARTIAL RECONSIDERATION

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EXECUTIVE SUMMARY

The GPR Service Providers Coalition ("GPR Providers") seeks partial reconsideration of the Report and Order in this Docket insofar as it affects the GPR industry. This Petition sets forth in detail the numerous and varied ways in which GPR technology has been, is being, and can be, used to promote human safety. GPRs are used on the nations highways, runways, bridges, tunnels, dams, and construction sites, in nuclear facilities and buildings undergoing renovation, in defense and law enforcement, and in a myriad of other critical applications, to efficiently and accurately detect invisible subsurface conditions. Although no instances of interference from GPRs have been reported, the Part 15 rules as adopted would effectively kill this industry and eliminate the essential services which GPRs now provide.

To avoid this undesired consequence, GPR Providers ask the Commission to revise the rules in the following respects:

1. Expand the category of eligible users to include existing service providers and governmental entities while preventing use by mere hobbyists.

2. Modify or clarify the coordination procedures to eliminate unnecessary paperwork and limit pre-coordination to sites or conditions where pre-coordination is truly warranted.

3. Delete the automatic turn-off requirement which would make the existing fleet obsolete, and substitute a requirement that GPR equipment emit transmissions only under the control of an eligible operator.

4. In the absence of any evidence that GPRs have or will create interference, relax the power emission constraints to a level commensurate with unintentional radiators.

If these remedial measures are not taken, the Commission should realistically evaluate the potentially fatal effect of the new rules on the many small businesses which make up the GPR industry.

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The GPR Service Providers Coalition ("GPR Providers") hereby petitions the Commission, pursuant to Section 1.429 of the Commission's rules to reconsider certain elements of the First Report and Order issued April 22, 2002 in the above Docket. Specifically, we seek the following minor modifications of the rules as adopted:

- An expansion of the authorized GPR users to include a broader range of governmental organizations and professional firms working in the subsurface testing field

- Modification of the coordination procedures to reflect the practical realities and exigencies of GPR use and to relieve the paperwork burden on all parties

- Revise the automatic turn-off switch requirement so as to accomplish the same purpose without potential disruption to operations

- Relaxation of the emission mask as unnecessarily restrictive for GPR applications

These relatively modest adjustments to the rules will facilitate the important public safety contributions of GPR service. In addition, GPR Providers seek reconsideration of the Commission's determination that the new rules will have no adverse effect on small businesses. As adopted, though not as proposed in the NPRM, the rules would virtually eliminate an entire industry of small GPR service providers. This disastrous effect should be taken into account.

I. BACKGROUND

A. Applications.

Ground Penetrating Radar ("GPR") is an ultra-wideband technology that has been in use for more than 30 years by the Department of Defense, numerous government agencies, and private industry for a wide variety of public safety and defense-related applications. The technology was originally developed as a means of detecting land mines and underground tunnels in combat environments and in locating ground water. The usefulness of such systems in detecting other underground hazards and conditions immediately became apparent, and in the intervening decades the technology has become an integral and vital part of surveying subsurface conditions for engineering, geo technical, environmental, and other public safety and scientific applications.

One extremely common use of the technology is in highway and airfield pavement testing. At least ten different state highway systems, and the Federal Highway Administration use GPR extensively to test highway pavements for underlying defects which would not otherwise be readily detectable. Discovering these defects has avoided catastrophic failure of the pavements and has saved lives. GPR has also been extensively applied to commercial and military airfield pavements, both by the USAF and by numerous consulting and testing companies. GPR highway devices are drawn along the road surface at up to normal traffic speeds, and data regarding the roadbed beneath is recorded precisely. Review of the resulting data can establish quickly and economically the subsurface road structure, and pinpoint where this structure is flawed, undermined, or otherwise hazardous. The safety implications of this process are obvious. In airport applications, the use of GPR has ensured that underlying runway defects do not cause aircraft landing or taking off at hundreds of miles per hour to crater into unseen potholes. For ordinary highway testing, GPRs eliminate the need to block entire lanes of traffic for hours or days in order to permit laborious testing by outdated mechanical boring methods. The need to apply these latter methods is not only hazardous to the road crews who have to work on the surface adjacent to traffic flow, but creates hazards to the traffic itself. The speed and utility of GPR technology has repeatedly detected subsurface hazards that would otherwise never have been discovered in time to prevent dangerous conditions from developing. The use of the technology on bridges is especially important since these structures are not only particularly susceptible to subsurface deterioration, but any lane closings for testing are extremely disruptive of traffic. Similar considerations apply to tunnels, where speedy testing is critical to safety and traffic flow.

GPR systems are routinely used to test subsurface conditions in nuclear power plants and hazardous waste facilities. In these conditions, it is critical that the integrity of containment structures be assessed and any defects identified and repaired immediately. There is simply no other methodology that can accomplish this task with the speed, accuracy and unobtrusiveness of GPR. For the same reason, GPR has proved an ideal technology for testing dam structures quickly and reliably. The risks to public safety of *not* detecting subsurface defects are so extreme in these environments that GPR is virtually a necessity.

GPR also has other critical applications. Every year literally millions of excavations take place in this country. Whenever a bulldozer or backhoe excavates a piece of land, there is always the danger that underground pipes, conduits, tanks, wires or other materials will be damaged. According to One Call Systems International (OCSI) statistics, each year more than 3,500 accidents are caused by excavations on public property near gas pipelines without a clear apprehension of the subsurface environment. About 10% of these accidents result in fatalities.

Significantly more deaths and injuries occur from excavations made on private property and near buried electrical cable and conduits. The National Transportation Safety Board[1] states:

> A single pipeline accident has the potential to cause a catastrophic disaster that can injure hundreds of persons, affect thousands more, and cost millions of dollars in terms of property damage, loss of work opportunity, community disruption, ecological damage, and insurance liability. Excavation and construction activities are the largest single cause of accidents to pipelines.

GPR use for pre-excavation surveying is routinely performed to prevent not only the loss of life which results from these construction accidents, but the huge loss of productivity to businesses and individuals attendant upon the severing of fiber optic cables, telephone wires, gas pipes, water pipes, structural rebar, tensioning cables, etc. When construction activities encounter unexpected archaeological artifacts, archaeologists use GPR to determine the extent of the potential site impact under antiquities laws, during which construction is halted. In a similar vein, GPR is used to test concrete slabs and building floor substrata for defects and to locate conduits, wiring systems, rebars and other features. By being able to identify the subsurface layout of building and parking garage floors in advance, repairs and new construction can be undertaken safely and without unnecessary destruction of sound elements of the existing structure. This is especially important in life critical facilities such as hospitals and nuclear power plants. A GPR investigation through a slab or wall minimizes the electrocution risk to construction workers, as well as disruption of facilities undergoing renovation.

GPR is also used for a number of environmental-safety and geologic mapping applications. For example, GPR is perhaps the most commonly used and reliable "non invasive" technology to locate buried underground storage tanks (USTs), trenches, lagoons, and drums at a

[1] Protecting Public Safety Through Excavation Damage Prevention. Safety Study NTSB/SS-97/01, 106p.

variety of public and industrial sites. Leaking USTs are a common source of soil and ground-water contamination, and GPR provides a safe and effective means of locating these potential sources of contamination. GPR is used to evaluate and map subsurface conditions at industrial sites so as to provide for the less costly and more effective characterization and remediation of subsurface contamination at such sites. The use of GPR enables monitoring wells and remediation systems to be constructed in optimal locations to determine the extent of contamination without disruption to existing pipeline and electrical systems. The Department of Agriculture owns and operates 12 GPR units for investigation of soil properties, agricultural non-point source pollution, and related issues. GPR has been used by the U.S. Geological Survey and private GPR service providers to map subsurface geologic conditions and geologic hazards, such as fractures and voids in bedrock. GPR is used in non-invasive archaeological investigations of burial grounds and other properties of historical or cultural significance. GPR service providers assist law enforcement agencies to reconstruct crime scenes and search for bodies and other buried evidence. In addition, GPR continues to be used in many of the original defense-related applications such as the location of unexploded ordinance (UXO) and in the detection of buried mines and hidden tunnels. These and other applications of GPR have direct and important benefits to the environment and the public health, safety and welfare which cannot be provided by alternative or comparable means.

B. GPR Users.

The GPR industry has developed as an industry comprised of a few hundred small, high tech businesses. The vast majority of GPR service providers have fewer than ten employees, and most are owner-managed. A few state highway departments (such as the Texas Department of Transportation) own and operate their own GPR devices. Most commonly, however, the GPR testing in the various applications described above is contracted out to expert private companies who own and operate the GPR equipment and assist in interpreting the data gathered. Most government agencies and private companies rely on these GPR service providers because of their expertise in operating the equipment and interpreting the data. Most people relying on GPR services are reluctant to purchase the equipment themselves because of the costs involved. GPR equipment is not intended for consumer use and, to our knowledge, has never been so used. Not only is it costly (a typical device costs anywhere from $15,000 to $125,000 new) but considerable technical sophistication is required to be able to interpret the data intelligently. Almost universally, the operators are trained engineers, geophysicists or scientists, many of whom hold advanced degrees and/or professional licenses and certifications in their respective fields. Petitioner here, the GPR Service Providers Coalition, are an ad hoc group of some 40 such businesses, most of whom would not be able to provide the vital services described above if the UWB rules are not adjusted.

Although GPR systems provide valuable public safety information in a wide range of situations, the actual number of GPR units and GPR operators is relatively small. There are an estimated 1000 GPR units operating in the US, operated by an estimated 350 organizations, consisting mainly of small specialized service companies. On any given day, there might be 200 – 300 GPRs operating throughout the entire USA. Thus, GPR use is widely scattered. In our experience, it is highly unusual for more than one GPR device to be in use in a single community at any one time. The Texas DOT, for example, has three devices to cover the entire state. There is therefore no potential whatsoever for a concentration of GPR signals which might raise interference concerns. This industry has grown very gradually over the past 30 years, and there is no indication that there will be a drastic change in growth rate. The industry has had an excellent record of public service. There is no recorded or reported evidence that GPR operation has ever caused discernible interference to communications or to any other service in the 30 years of GPR operation.

C. The Need for UWB GPR Operation.

GPR operates by transmitting short pulses of energy into earth and construction materials, and receiving reflected pulse returns from the subsurface layers and discontinuities in these materials. The short pulse produced by a GPR system, required in order to clearly define the subsurface objects being detected, requires a broad frequency band. GPR applications to pavements, bridge decks, and building structures require frequencies in the 500-2000 MHz range, and typical GPR equipment for these applications has a center frequency of 1000 – 1500 MHz. This frequency range and center frequency provides both the depth required to penetrate the structural materials, and the resolution required to accomplish the various detection tasks outlined in section (A) above. In order to get the needed signal penetration into the material being examined, frequencies below 960 MHz must be emitted. In order to resolve pavement layers and near-surface defects, reinforcing steel, structural damage, and voids, frequencies in the 1-2 GHz range are needed. The extraordinary benefit of GPR technologies currently in use is that they deliver both the depth and resolution objectives effectively and concisely. The emissions spectrum of a UWB GPR must be smooth with no spikes or lumps in order to deliver a well-defined pulse. The rules as presently adopted (Section 15.509(a)) limit GPR operation to frequencies below 960 MHz, and thus eliminate all GPR applications to pavements, bridge decks, and building structures.

Deeper applications of GPR, such as location of underground pipes, utilities and buried drums, use center frequencies below 960 MHz to achieve the greater depth of penetration, but also radiate above 960 MHz. The limited test data available suggest that the radiated emission levels set forth in new rule 15.509(d) for emissions above 960 MHz could eliminate many of these lower frequency systems as well.

Attached hereto is a letter from the Environmental and Engineering Geophysical Society corroborating these facts and expressing the Society's concern that the new rules will unnecessarily impede GPR operations. We also attach the supporting letter filed in this Docket by the Society of Exploration Geophysicists on May 3, 2001.

D. Advanced Notice of Proposed Content of New Rules.

Although several GPR Providers filed comments in the earlier rulemaking proceedings, no one, including GPR Providers, commented on either the eligibility criteria or the coordination requirements discussed below. Nowhere in the Notice of Proposed Rulemaking issued by the Commission in this Docket was it suggested that eligibility of GPR use might be restricted, that unattended operation was an issue, or that coordination requirements – highly atypical for unlicensed facilities – might be imposed. The *R&O* was the first glimmer that these matters were even under consideration. Basic fairness, not to mention the requirements of the *Administrative Procedures Act*, 5 U.S.C. § 553, requires that the Commission consider these issues now. *Home Box Office v. FCC*, 567 F. 2d 9, 55 (D.C. Cir. 1977), cert. den. 434 U.S. 829 (1977); *American Medical Ass'n v. Reno*, 57 F. 3d 1129, 1132 (D.C. Cir. 1995).

II. SPECIFIC MODIFICATIONS REQUESTED

A. Definition of Eligible Users.

Newly adopted rule 15.509(b)(1) limits operation of GPRs to law enforcement, fire and emergency rescue organizations, scientific research institutes, commercial mining companies, and construction companies. Users must also be Part 90 eligibles. As noted above, this definition fails, we believe unintentionally, to account for the vast majority of existing and projected users of GPR devices, including those GPR users who provide services on a contract basis to the aforementioned groups. First, as noted above, federal, state and local transportation departments are extremely important current and projected users of the technology. They do not appear to be included. Second, the actual operators of the devices in most of the critical applications described above are not the governmental organizations themselves but professional firms who own and operate the devices and undertake tests under contract with the governmental or other organizations requiring the service.

We believe that the eligibility problem can be corrected by redefining eligible users in rule 15.509(b) as follows:

> GPRs and wall imaging systems operated (i) by federal, state or local governmental bodies in connection with law enforcement, fire, emergency and rescue operations, transportation, and other testing for subsurface conditions, (ii) by educational and scientific research institutes, (iii) by commercial mining and construction companies, and (iv) by subsurface testing eligibles.

A new definition would also be added to the definitions in 15.503:

> Subsurface testing eligible. A commercial enterprise which provides professional subsurface testing services to others on a contract basis.

We believe that these definitions are both broad enough to include the existing GPR user community and narrow enough to exclude consumers, hobbyists and other casual users of GPR. We emphasize that GPR use today is limited as a practical matter to professionally trained operators in commercial firms. Not only is the equipment sufficiently expensive to deter non-commercial personal use, but it requires a high level of education, training, and technical sophistication to collect and interpret the data meaningfully. The proposed definitions, as well as these practical considerations, ensure that the universe of GPR users will be relatively circumscribed. At present we estimate that there are about a thousand GPR devices in service domestically, and there is no reason to project inordinate growth from the adoption of the rules proposed here.

On the contrary, unless the rules are expanded to include the entities envisioned by the proposed language, virtually the entire GPR service industry – including state and federal transportation departments that now rely on the service – will be barred from using the technology. Such an outcome could have disastrous consequences for the many safety-related functions now performed using GPR which cannot be performed by alternative or comparable means.

B. Coordination Process.

The coordination process set out in Section 15.525 of the rules calls for coordination of UWB imaging devices prior to their use. The rule calls for submission of contact information for the user, "the desired geographical area of operation," and identifying information regarding the imaging device. This information is to be supplied to the FCC, which will then coordinate with NTIA. The FCC and NTIA will then issue a "coordination report" which will specify constraints on day-to-day operation. The rule specifies that "routine coordination" will not take longer than 15 days, with emergencies to be handled on an expedited basis. Unfortunately, unless the parameters of the coordination are extremely broad, this coordination process will be wholly unworkable.

GPR and wall imaging systems are inherently mobile. In the case of highway systems, thousands of miles of roadway must be tested throughout the U.S. Sometimes the tests conducted are routine, but more often the requests for GPR testing are associated with an immediate concern. Either there is an imminent threat to safety from a suspected (but as yet unknown) subsurface hazard, or construction or repair activity is poised to occur pending evaluation of subsurface conditions. Most often, the call to do testing requires an almost immediate response. The GPR testers arrive at the survey location, perform their tests, and leave for another site. The upshot of these circumstances is that it would be difficult, if not impossible, to coordinate every projected use of GPR equipment on a case-by-case basis.

Conservatively estimating that the 1000 GPR devices now in service are in use 200 days a year, with each job taking an average of two days, the FCC and NTIA would have to evaluate 100,000 coordination requests per year. Unless the Commission and NTIA hire huge numbers of staff personnel to accomplish this coordination, it is wholly unrealistic to imagine that this coordination can be done in a matter of two or three months, much less 15 days. Eventually, the requests processed would all become "emergencies" and little routine preventive testing could ever go forward. Apart from the burden on the FCC and NTIA, the burden on the GPR users would be enormous. The sheer volume of paperwork necessitated by the coordination process is daunting. This is particularly so since the industry is largely composed of very small businesses whose staff are frequently out in the field doing actual testing and are not in a position to file forms with the Commission every few days.

It also bears stressing that GPR use is widely scattered. In our experience, it is highly unusual for more than one GPR device to be in use in a single community at any one time. The Texas DOT, for example, has three devices to cover the entire state. There is therefore no potential whatsoever for a concentration of GPR signals which might raise interference concerns.

The purpose of the coordination requirement is presumably to ensure that any adverse effects from GPR use can be identified and the user contacted to follow up or to terminate operations as appropriate. Starting from the premise that no GPR operation has ever caused discernible interference to any other service in the 30 years of GPR operation, it is important not to create a heavier burden on the industry and the affected safety conditions than is actually warranted. In the vast majority of cases, the GPR operation will either be ephemeral or will be in a remote location where there is literally no potential for interference to any sensitive facility. On the other hand, the GPR service providers are mindful of the need to protect locations where there may be a particular susceptibility to interference or where the creation of interference could be problematic. Such areas could be defense installations, airports, radio astronomy facilities or other highly sensitive communications sites. These sites are limited and are well defined. Because GPR signals are both directed toward the ground and are of extremely low power, even under the most conservative assumptions no detectable emissions beyond 20 meters from the devices have been predicted.[2] If either an adequate perimeter or proper precautions were established around the defined sensitive facilities, this would establish a defined area and specific conditions within which a more detailed coordination procedure could be implemented to govern any proposed GPR use. There should be little practical need to coordinate any other specific sites.

With these principles in mind, GPR Providers suggest the following coordination plan. Each GPR user would have to register initially with the Commission, providing name, address, and contact information, including a method for ordering the user to terminate operations immediately in the unlikely event that interference were ever experienced. The GPR user would specify an area of operation which would fairly define the region in which it regularly operates. (Some operate primarily in one or two states, others operate regionally, and a number have more national ranges.) The user would also supply identifying information regarding its equipment. It

[2] See NTIA Report dated Feb. 14, 2002, filed Feb. 22, 2002 in ET Docket 98-153. ("NTIA Report")

should be noted however that older equipment will not include FCC ID numbers since the equipment has not been certificated. Where available, of course, that ID number would be supplied. Having so registered, the user would be free to operate throughout its registered service area except within the perimeter of defined sensitive areas.

To protect the sensitive locations, NTIA could establish and periodically update a list of sites or (categories of sites) for which pre-coordination would be required. These would be broken into three categories. Category 1 sites might simply warrant that the Commission be notified in advance of the specific area of proposed GPR operation so that if there were any problem it would be an easy matter to contact the GPR operator and order the cessation of operations. No advance "approval" or response from the FCC would be necessary. For a more limited number of defined sites (Category 2), it might actually be justified to require pre-use coordination so that NTIA could be sure that no disruption of sensitive communications would be caused. Here we envision a pre-operation coordination process of not more than five days. Finally, there might be areas (Category 3), such as quiet zones (described in rule 1.924), observatory sites (described in rule 25.213) or similar facilities defined in the frequency allocation tables, where GPR use could be restricted altogether unless there is an emergency.

The concept here is that the sites that require special evaluation and coordination represent a very tiny minority of the sites where GPR activity will occur. It makes sense to concentrate the resources of the Commission, NTIA and the industry in resolving those rare exceptional cases rather than impeding the use of GPR as a whole. We also note that in many cases the GPR operations at the sensitive sites will be taking place *at the invitation* of the site manager (an airport testing its runways for hidden defects or a nuclear plant testing concrete casings, for example). Thus, typically, any GPR use within a sensitive perimeter would be known to and approved by the operator of the sensitive site as part of the testing process itself.

We believe that the coordination process proposed here would not be unduly burdensome (particularly if the registration and pre-coordination process could be handled electronically over the internet) and would accommodate the concerns of all interested parties. It would also eliminate what appears to be an enormous manpower burden on both the government and industry.

C. Automatic Shut-Down Switch is Unnecessary and Will Compromise Operations.

Section 15.509(c) of the rules requires imaging system equipment to include an automatic shut-down switch, a manually operated switch that would de-activate the transmitter within 10 seconds if it is not depressed by an operator. The purpose of the rule is "to ensure that operation occurs only when the GPR is directed towards the ground," *R&O* at ¶ 47, thus minimizing any potential for mis-aimed transmissions. We believe the purpose of the rule can be achieved less onerously and equally well without requiring the retrofit of much of the existing fleet of GPR devices.

Initially, we reiterate that GPR and wall imaging systems are operated by trained professionals. The very nature of the testing and surveys conducted using this equipment requires hands-on or immediately adjacent operation of the equipment by imaging professionals. No purpose would be served by leaving the equipment transmitting without actual operator direction and control, nor would there be any reason to direct the radiation anywhere other than directly into the material being examined. As a practical matter, therefore, the condition against which the rule is trying to guard never occurs.

Secondly, GPR Providers are concerned that the mandatory installation of automatic shut-down switches could compromise their ability to perform tests. In typical GPR surveys, the operator is occupied with looking where he/she is going, avoiding obstacles, observing the data, and making manual marks in the data at reference locations. Having to hold down an automatic cutoff switch while performing these other tasks would either compromise the operations, or require a second operator simply to hold down the switch. The accidental release of the switch could be costly. In one of the common applications of GPR technology, the device is transported along roadways at normal traffic speeds to assess the condition of the pavement. In this scenario, if a switch were inadvertently released and the equipment turned off, the resulting loss of data would require the repeat of the entire run. Even though the operator would presumably recognize the "off" condition almost immediately, the team would, in an interstate highway environment, have to advance many miles to a turnaround point, backtrack many miles to another turnaround point, identify where the inadvertent turn-off occurred, and re-sequence the testing process from that point. This circling around could happen several times in the course of a single survey, consuming considerable time and making it more difficult to present and interpret the data gathered. In addition, we note that hand-operated GPR devices require the operator to guide the device and manipulate a variety of switches at the same time. It would be difficult and counter-productive to try to keep one hand clutched on a turn-off switch while trying to perform all the other necessary functions with the other hand. In none of these cases would an automatic turn-off be necessary, useful or desirable.

The requirement for the automatic shutoff switch would force the owners of an estimated 1000 GPR units to return them to the manufacturers for a retrofit. This retrofit is not feasible when the equipment represents older models which are no longer manufactured and are not supported by the manufacturers. Also, many existing GPRs may not be readily adapted to automatic shut off. Therefore, this requirement could easily force many current GPR operators to discontinue their work.

We suggest, therefore, that instead of an automatic turn-off requirement, the rule should simply require that imaging systems be operated only under the immediate control and supervision (whether manual or remote) of an eligible operator. This rule would not only square with current practice but would also ensure that the devices are properly operated in the manner intended. It would not only avoid the counterproductive and deleterious accidental turn-off which could occur with an automatic switch, but also accomplish the protection function apparently contemplated by the rule as originally written.

D. Relaxation of the Emission Mask.

The Commission's NPRM in this Docket began with the premise that "the risk of interference from GPRs is negligible because the overwhelming majority of their energy is directed into the ground where most of the energy is absorbed." *Revision of Part 15 of the Rules Regarding Ultra-Wideband Transmission Systems*, ET Docket 98-153, 65 Fed Reg. 37332, June 14, 2000 at Paragraph 25. Nothing in the voluminous public record of this Docket supported a contrary conclusion. Despite this evidence – or, more properly, despite the lack of evidence of any potential harm – the rules as adopted impose highly and unreasonably restrictive limits on the power at which these systems can operate.

A very broad range of GPR and imaging applications involve signal penetration of a half a meter or less into the surface to be examined. This range includes pavements, bridge decks, and buildings, as described earlier. For these systems, sufficient resolution of the anomalies and layer boundaries requires operation above 960 MHz – typically in the 1 - 2 GHz range. The

R&O seemed to recognize the need for GPRs to operate below 2 GHz for these reasons. *R&O* at ¶ 46. The new rules, however, require that the UWB bandwidth of imaging systems must be below 960 MHz. This aspect of the new rules effectively eliminate this entire class of GPR operations.

A second aspect of the new rules requires that for systems whose center frequency is below 960 MHz, radiated emissions above 960 must be attenuated to an average of -65.3 dBm. A broad class of GPR applications (industrial pipe and buried drum detection, environmental contamination assessments, groundwater detection, etc.) utilize equipment that falls into this category. Available data indicates that this lower frequency equipment may exceed the -65.3 dBm power level above 960 MHz. Therefore, this class of applications could be eliminated by the new rules as well.

These power constraints not only destroy the usefulness of GPRs for the applications noted above, but they are unwarranted by any identifiable interference threat. The following facts must be stressed:

1. GPRs have been used for more than 30 years commercially, often in or around sensitive communications facilities, with no known complaints of interference from their operations.[3] We believe that if interference were a problem, there would be at least anecdotal evidence of someone, somewhere, experiencing such interference. We repeat: no one in the GPR Service Providers Coalition <u>has ever received a complaint of interference</u>. This is remarkable in itself and carries some weight.

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[3]On May 22, 2002, petitioners became aware of anecdotal evidence of interference to an underground cable from a GPR operating on ground level as reported by one government agency, but no documented evidence trail is available. Since underground cable is universally shielded in metallic conduit, it is difficult to see how any interference could have been experienced.

2. Of particular concern to NTIA during the earlier proceedings was the potential for interference to GPS operations. In this regard, it should be stressed that many GPR applications require precise geographic location of the subsurface condition being examined. For example, road conditions are examined over many miles, and the GPR data must be correlated precisely to geographic coordinates in order to understand the results. To accomplish this, GPS devices are placed directly on top of, or immediately adjacent to, the operating GPR device. This is done <u>routinely</u> with no adverse effect whatsoever. Here again, the laboratory of years of experience in GPR/GPS relations is due considerable deference.

3. GPR Providers have offered to make typical GPR equipment available to NTIA and the FCC to test the potential for interference between GPR and GPS under typical operating conditions and parameters. We are confident that, when so tested, the potential for interference will be confirmed as nil.

4. Even using analysis developed by NTIA in Report 01-45, it is apparent that there is no interference potential whatsoever to GPS receivers beyond 20 meters from a GPR device. Indeed, the NTIA's own attempts to assess potential interference from a GPR device (Device E) were frustrated because the emission levels were too far below the laboratory instruments' noise level to permit measurement. NTIA Report 01-383, pp. 8-38 *et seq*.

Given all of these considerations, there is no valid basis to impose anything but the normal Class B limitation for unintentional radiation on GPR devices. By definition, GPR emissions are directed into the ground or other dense materials which absorb virtually all of the radiation immediately. The small amount of energy which radiates to the side is wholly extraneous to the purpose of the device and is "unintentional" or "spurious" in the truest sense of these terms. It should be noted that literally millions of computers operating throughout the

U.S. – many in heavy concentrations – radiate at Class B limits higher than those applicable to GPRs. By contrast, a handful of GPRs operate separately and at widely scattered locations in the U.S. Both radiations occur in the same frequency band; both are unintentional by-products of the intended function of the devices. Yet by any objective measure, the potential for interference to GPS operations – if there were any – is far greater from computers than from GPRs. A fairhanded treatment of the situation would be to either define GPR radiation other than that directed at the ground[4] as unintentional, and then apply a consistent emission level to GPRs and computers, *i.e.*, Class B levels. Alternatively, the Commission could simply recognize that GPR emissions have as little potential for interference as computers and adopt a consistent emission constraint.

III. ADVERSE EFFECTS ON SMALL BUSINESSES

Perhaps because the debate during the rulemaking proceeding was primarily among manufacturers, licensed incumbents, GPS interests and government agencies, and because GPR users had been presumptively deemed non-threatening, the effects of the new rules on the GPR industry were not adequately considered by the Commission. A few GPR service providers such as Infrasense, Inc. did submit comments pointing out that the GPR industry was composed of small companies.[5] That comment also pointed out that GPRs typically operate in the 500-1500 MHz band. Given the power levels adopted in the new rules for those frequency bands, it should have been apparent that continued operation in the GPR band would be impossible.

[4]It is our understanding that radiation directed into the ground or other dense material is not of concern to the Commission or NTIA.

[5] Comments of Infrasense, Inc. filed August 6, 2001 in Docket ET 98-153.

Nevertheless, the April 22 *Report and Order* concluded at Paragraph 277 that the new rules would "not have a significant economic impact on a substantial number of small business entities." This conclusion is erroneous.

The fact of the matter is that some 350 GPR firms are providing services in the U.S. today. These firms are typically very small, most with fewer than ten employees. As noted at the outset of this petition, these companies provide vital services to a broad range of public and private institutions with a need to detect potential hazards to life and property. While some GPR operations could continue in the below 960 MHz range, the vast majority of operations today require operation above 960 MHz – the very band where imaging operations have now been restricted. The necessary consequence of this development is that these 350 businesses will almost inevitably be put out of operation.

In evaluating the new UWB rules, we recognize that the Commission may wish to move cautiously to be sure that no new interference problems are created for existing spectrum users. However, the Commission must also take into account the fact that vital services are now being provided using existing UWB technology, that the businesses who provide those services will be destroyed if the rules are overly restrictive, that there are no practical alternatives for many of the services provided, and that there have been no known instances of interference to any other spectrum users in the 30 years of GPR operations. Given these circumstances, the Commission should reconsider its certification that there will be no significant economic impact on a substantial number of small businesses and conduct the regulatory flexibility analysis of the new rules, as required by the Regulatory Flexibility Act, 5 U.S.C. Section 601 *et seq*.

IV. CONCLUSION

For the reasons set forth above, the GPR Service Providers Coalition respectfully requests that the Commission revise the sections of Part 15 identified above in order to permit the continued provision of vital GPR services using UWB technology.

Respectfully submitted,

GPR Service Providers Coalition

By ____________________________
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June 17, 2002

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Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of

Revision of Part 15 Rules of the Commission's Rules Regarding Ultra-Wideband Transmission Systems	))))	ET Docket No. 98-153

Comments by the Society of Exploration Geophysicists

The Society of Exploration Geophysicists submits these comments in response to the Notice of Proposed Rule Making (NPRM), FCC 00-163, in the proceeding referenced above, and a more recent request for comments on testing by NTIA and others, and in response to recommendations and conclusions of others concerning proposed changes to Part 15 rules. The Society of Exploration Geophysicists (SEG) is the preeminent association representing applied geophysicists from the United States and around the world. The SEG has over 18,000 members employed who are active in the oil and gas, mineral, engineering, environmental, academic and government sectors. Many of our members could be adversely affected by FCC rulings on UWB uses of the electromagnetic spectrum and we wish our concerns to be noted.

Electromagnetic field methods form a key part of the geophysical approach to subsurface mapping and imaging in earth and earth related materials. For many decades this branch of science has used the fundamental characteristics of electromagnetic fields to probe the electrical properties of materials beneath the surface. Making such electrical property observations demands the use of electromagnetic fields; there is no other solution. In general, geophysicists use the electromagnetic spectrum from on the order of 10^{-4} Hz through to 10^{10} Hz with most measurement systems actively energizing the ground and being ultra wide bandwidth according to the FCC's NPRM on UWB. No one device covers the whole spectrum; most devices and methodologies span one to three decades of spectrum.

In the past, the geophysical needs have been mostly ignored in spectrum management although there has been input to the NTIA from the United States Geological Survey through the Department of Interior. In addition to our needs to measure electromagnetic fields in a scientific manner and use them in scientific analysis, geophysicists also need to use electromagnetic fields for communication and navigation. Many of our field survey methods need to acquire spatial positioning (e.g. GPS usage is now critical to our membership) and also to electronically transfer data from remote locations. As a result, we recognize the need to balance electromagnetic spectrum usage for communications and navigation against the need for fundamental scientific measurements of subsurface properties.

To date, geophysical electromagnetic systems have been non-intrusive in their usage of the electromagnetic spectrum. Although geophysical systems may create quite strong local fields, the transmission of such signals into the air is undesirable and minimized by the nature of coupling into the ground. Geophysical UWB sources are designed to energize the ground and are not communications devices.

In the course of rulemaking, we urge the Commission to recognize the following key issues.

1 Electromagnetic geophysical measurements are of a fundamental scientific nature and they play an essential role in everyday practical subsurface investigations. There is no alternate way of measuring these fundamental electrical properties.

2. Geophysical UWB sources are uniquely designed to energize the ground and must not be classified or treated in the same manner as communications devices.

3. Rules which are extremely onerous and require substantial paperwork, licensing and administration will have a huge adverse impact on our membership which is generally made up of individual practitioners, small groups of scientists, small manufacturers and service providers.

4. The unique manner of deploying transducers, which are closely coupled to the ground, makes representative measurement standards difficult and costly to replicate in a standard test facility. Standardized test procedures must be kept as simple and as low cost as is practical.

5. Impediments to novel geophysical applications will be minimized by using the unlicensed regulation approach as provided for unintentional radiators in Part 15. Sensible source power limits should be combined with the promotion of awareness of potential interference within our professional associations, vendor warning labels on devices and dissemination of "good practice" guides in user manuals to achieve regulation objectives.

We trust that the above information provides insight into our professional and industrial needs. As applied scientists, we recognize the need to be cognizant of spectrum usage and encourage our members to provide technical input to the Commission. Many of our members have provided constructive comment to the Commission individually and have cited the vast range of applications where our technologies are used with great benefit to society.

Respectfully Submitted on behalf of
SEG Executive Committee and the Society's Membership,

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May 3, 2001

Environmental
and Engineering
Geophysical Society

May 20, 2002

Mr. Julius Knapp
Deputy Chief of OET
Federal Communications Commission
445 12th St. SW
Washington, D.C. 20554

Subject: Revision of Part 15 of the FCC's Rules
Regarding Ultra-Wideband Transmission Systems

Dear Mr. Knapp:

On behalf of the Environmental and Engineering Society (EEGS), an international professional society of geophysicists, geologists, engineers and geoscientists, I wanted to voice our collective concerns for the likely promulgation of this FCC rule promulgation. The new rule would greatly reduce and in some cases essentially eliminate the use of ground penetrating radar (GPR) from commercial use within the United States. The new FCC rule would effectively remove a vital subsurface characterization tool, which cannot be replaced by other technology. Unfortunately, the new rule appears to be based on limited laboratory tests that do not honestly and correctly evaluate the field use of GPR to accurately determine potential interference of the technology. The new rule also appears to disregard the potential economic impact of the rule to many businesses that presently conduct GPR surveys.

Ground penetrating radar (GPR) has been an integral state-of-the-practice tool for evaluating subsurface conditions for over thirty years. While advancements in the functionality and ease of use of GPR are continually being made, the technology is not new. GPR has been and currently is a necessary investigation tool used by government agencies, private firms, academia, and the military. The technology is presently used for a wide range of applications including archeology, agriculture, search and rescue (particularly avalanche), education, unexploded ordnance, environmental monitoring, pavement evaluation, pre-excavation assessment for damage prevention, earthquake fault investigation, and volcanology. Other applications are clearly important to the growth and security of the United States. For example, GPR is currently being used at the World Trade Center site to assist in the rebuilding efforts (*Underground Focus*, April 2002, p. 22). Other significant projects in which GPR plays a vital role include:

- Evaluating contaminated ground at Department of Energy and Department of Defense sites around the country;
- Characterizing the subsurface before, during, and after major infrastructures are built (e.g. highways, bridges, dams, airports and tunnels);
- Locating utilities before excavations are made ensuring safety of workers; and
- Detecting and evaluating geologic hazards (e.g. landslides and sinkholes) before they pose a problem to the public.

In over thirty years of using GPR, there is no documented case or instance where conducting GPR survey in the field caused interference to other devices using the radio frequency spectrum. In fact, many surveys are conducted using a GPS system during data collection, one of the other technologies that GPR has been accused of interfering with. In conducting a GPR survey, the radar wave is directed into the ground for short periods of time to during data collection. The GPR device only transmits a signal when the survey is actually progressing over the ground. Because the transmission has low power and is directed into the ground, interference with other systems is not a problem. NTIA's own testing (NTIA 01-383 p.3-83) could not measure a GPR output using Part 15 testing procedures, and stated "The signal from Device E was apparently below measurement system noise and Part 15 measurements could not be performed."

The FCC regulations will directly effect all ground penetrating radar manufacturers, all geophysical service providers who use GPR, and ultimately any geoscientist or engineer who rely on such technology for solving engineering, infrastructure, transportation, environmental, and hydrogeologic problems. In particular, the total ban from 960 MHz to 3.1 GHz will severely impair the ability to locate voids beneath runways and pavement, find areas of deterioration and delamination on bridges, and locate electrical conduits in slabs. It will prevent helping law enforcement agencies from locating burials beneath concrete and from verifying the amount of asphalt materials for which the government was charged.

The rule states that the FCC certifies that this "Report and Order will not have a significant economic impact on a substantial number of small entities." This statement is incorrect. In fact, this new rule will impact many geophysicists and geoscientists as well as hundreds of companies.

Because of the nature of GPR surveys transmitting directly into the ground, and the inability to show interference of the technology with other users in the field, we are asking that the FCC regard GPR differently from other UWB devices. We believe GPR should be considered as a spurious transmitter in air, and it therefore must conform to the existing emission limits of FCC Rules, Part 15 Class B. Moreover, the new rule does not adequately test the banned technology for significant interference with other users, nor does it fully consider the ultimate economic ramifications of the rule.

Obviously, much more could be said about specifics of the proposed rule, but our intent here is to provide you a brief summary of our concerns. If you have any questions, please feel free to contact me at (303) 740-2668.

Sincerely,

John J. Nicholl, Jr., P.G
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